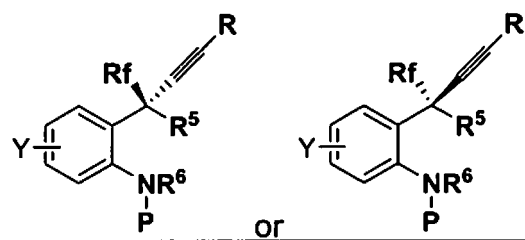


### Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

#### Listing of Claims:

**Claim 1 (Currently amended):** A process for synthesizing a chiral compound having a formula of



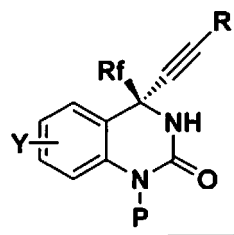
wherein Y is H, mono- or multi-substituted electron-withdrawing group or electron-donating group, and is located at *m*-, *o*-, or *p*-position of the benzene ring;

P is hydrogen or an amino protecting group;

Rf is a fluoro-containing alkyl;

R is a trialkylsilyl, alkyl, cycloalkyl, or aryl group;

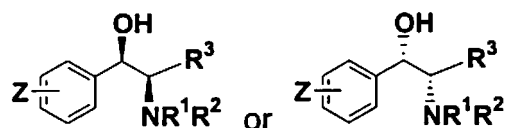
R<sup>6</sup> is hydrogen and R<sup>5</sup> is hydroxy, or R<sup>5</sup> and R<sup>6</sup> are linked as –HNCO– to form a ring as in



or its enantiomer,

comprising the steps of

(a) mixing a chiral ligand (1R, 2R)-2-N, N- substituted-1-(substituted -phenyl)-2-R<sup>3</sup>-substituted-2-aminoethanol or its enantiomer having a formula of

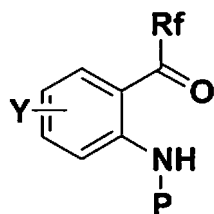


with a terminal alkyne and a Zn(II), Cu(II) or Cu(I) salt in the presence of an organic base in an aprotic solvent to form a mixture,

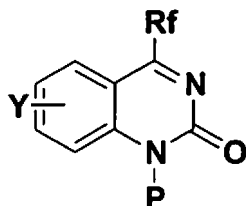
wherein R<sup>1</sup>, R<sup>2</sup> is an amino protecting group; R<sup>3</sup> is an alkyl, alkyl-substituted with an alkyloxy or silyloxy, carboxylic group, carbalkoxy group, hydroxyl methyl, cycloalkyl, aryl, or CH<sub>2</sub>OR<sup>4</sup>, R<sup>4</sup> being an oxygen protecting group; Z is H, a mono- or multi-substituted ~~subsubstituted~~ electron-withdrawing group or electron-donating group, and located at m-, o-, or p-position ~~positen~~ of the benzene ring[:], and  
~~with a terminal alkyne and a Zn(II), Cu(II) or Cu(I) salt in the presence of an organic base in an aprotic solvent,~~

wherein the terminal alkyne is H—≡—R, and R is a trialkylsilyl, alkyl, cycloalkyl, or aryl group,

(b) mixing with the mixture with a reactant having a formula of



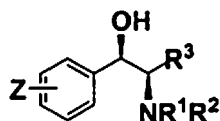
or



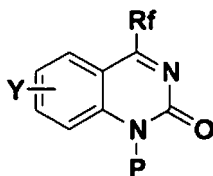
wherein P is hydrogen or an amino protecting group, Rf is a fluoro-containing alkyl, Y is H, a mono- or multi-substituted electron-withdrawing group or electron-donating group and located at *m*-, *o*-, or *p*-position of the ring[;], and

(c) isolating and obtaining the a chiral compound.

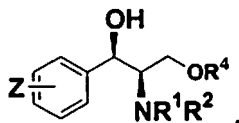
**Claim 2 (Currently amended):** The process of claim 1, wherein the chiral ligand (1R, 2R)-2-*N*, *N*-substituted-1-(substituted -phenyl)-2-R<sup>3</sup>-substituted-2-aminoethanol or its enantiomer is (1R, 2R)-2-*N,N*-substitutedamino-1-(substituted-phenyl)-2-substituted-2-aminoethanol having a formula of



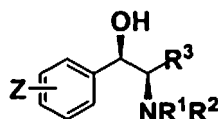
, and the reactant is



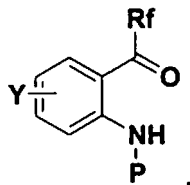
**Claim 3 (Previously presented):** The process of claim 2, wherein the chiral ligand is (1R, 2R)-2-*N,N*-substitutedamino-1-(substituted-phenyl)-3-*O*-*R*<sup>4</sup>substituted-propane-1-ol or its enantiomer having a formula of



**Claim 4 (Previously presented):** The process of claim 1, wherein the chiral ligand is (1R, 2R)-2-*N,N*-substitutedamino-1-(substituted-phenyl)-2-*R*<sup>3</sup>-substituted-1-ethanol or its enantiomer having a formula of



and the reactant is



**Claim 5 (Previously presented):** The process of claim 1, wherein *R*<sup>1</sup> and *R*<sup>2</sup> is an alkyl, substituted alkyl, benzyl, trialkylsilyl, or substituted benzyl, the substituted

group being a phenyl, naphenyl, halo, nitro, hydroxy, C<sub>1</sub>~C<sub>3</sub> hydroxyalkyl, C<sub>1</sub>~C<sub>4</sub> alkyl, or C<sub>1</sub>~C<sub>3</sub> alkoxy, or R<sup>1</sup>, R<sup>2</sup> being -(CH<sub>2</sub>)<sub>n</sub>X(CH<sub>2</sub>)<sub>m</sub>-, X being CH<sub>2</sub>, O, or NH; n, m is an integer from 1 to 6;

P is hydrogen, an alkyl, substituted alkyl, benzyl, trialkylsilyl, or substituted benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy;

R<sup>4</sup> is an alkyl, substituted alkyl, benzyl, trialkylsilyl, or substituted benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy, C<sub>1</sub>~C<sub>3</sub> hydroxyalkyl, C<sub>1</sub>~C<sub>4</sub> alkyl, C<sub>1</sub>~C<sub>3</sub> alkoxy or CN;

the electron-withdrawing group is a halogen, NO<sub>2</sub>, CF<sub>3</sub>, CH<sub>3</sub>SO<sub>2</sub>, CH<sub>3</sub>CH<sub>2</sub>SO<sub>2</sub>, PhCH<sub>2</sub>OCO, or AcO;

the electron-donating group is an alkoxy, OH, Me<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, Et<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, NH<sub>2</sub>, or C<sub>1</sub>~C<sub>4</sub> alkyl.

**Claim 6 (Currently amended):** The process of claim 1, wherein R<sup>1</sup> and R<sup>2</sup> is a C<sub>1</sub>~C<sub>20</sub> alkyl, C<sub>1</sub>~C<sub>20</sub> substituted alkyl, trialkylsilyl, benzyl, or substituted benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy, C<sub>1</sub>~C<sub>3</sub> hydroxy alkyl, C<sub>1</sub>~C<sub>20</sub> alkyl, or C<sub>1</sub>~C<sub>3</sub> alkoxy, or R<sup>1</sup>, R<sup>2</sup> being -(CH<sub>2</sub>)<sub>n</sub>X(CH<sub>2</sub>)<sub>m</sub>-, X being CH<sub>2</sub>, O, or NH;

n, m is an integer from 1 to 6;

R<sup>3</sup> is a C<sub>1</sub>~C<sub>20</sub> alkyl, C<sub>1</sub>~C<sub>20</sub> alkyl substituted with an alkyloxy or silyoxy, carboxylic group, C<sub>1</sub>-C<sub>20</sub> carbalkoxy group, hydroxyl methyl, C<sub>3</sub>~C<sub>20</sub> cycloalkyl, aryl, or CH<sub>2</sub>OR<sup>4</sup>, R<sup>4</sup> being a C<sub>1</sub>~C<sub>20</sub> alkyl, C<sub>1</sub>~C<sub>20</sub> substituted alkyl, benzyl, or substituted

benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy, C<sub>1</sub>~C<sub>3</sub> hydroxyalkyl, C<sub>1</sub>~C<sub>4</sub> alkyl, C<sub>1</sub>~C<sub>3</sub> alkoxy, or CN;

Z is H, F, Cl, Br, I, CH<sub>3</sub>SO<sub>2</sub>, OH, PhCH<sub>2</sub>O, AcO, MeO, EtO, Me<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, Et<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, PhCH<sub>2</sub>OCO, *t*-Bu, *i*-Pr, NH<sub>2</sub>, or NO<sub>2</sub>;

P is hydrogen, a C<sub>1</sub>~C<sub>20</sub> alkyl, C<sub>1</sub>~C<sub>20</sub> substituted alkyl, benzyl, trialkylsilyl or substituted benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy, C<sub>1</sub>~C<sub>3</sub> hydroxyalkyl, C<sub>1</sub>~C<sub>4</sub> alkyl, C<sub>1</sub>~C<sub>3</sub> alkoxy, or CN;

Y is H, F, Cl, Br, I, CH<sub>3</sub>SO<sub>2</sub>, OH, PhCH<sub>2</sub>O, AcO, MeO, EtO, Me<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, Et<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, PhCH<sub>2</sub>OCO, *t*-Bu, *i*-Pr, NH<sub>2</sub>, or NO<sub>2</sub>;

R<sub>f</sub> is a C<sub>1</sub>~C<sub>20</sub> fluoro-containing alkyl;

R is a trialkylsilyl, C<sub>1</sub>~C<sub>20</sub> alkyl, C<sub>3</sub>~C<sub>20</sub> cycloalkyl, or aryl group.

**Claim 7 (Previously presented):** The process of claim 1, wherein R<sup>1</sup> and R<sup>2</sup> is a C<sub>1</sub>~C<sub>4</sub> alkyl, tri-phenylmethyl, *t*-butyldimethylsilyl, benzyl unsubstituted or substituted with C<sub>1</sub>-C<sub>4</sub> alkyl, *para*-methoxy benzyl, *para*-nitrobenzyl, *para*-chlorobenzyl, 2, 4-dichlorobenzyl, or 2, 4-dimethoxybenzyl, or R<sup>1</sup>, R<sup>2</sup> being - (CH<sub>2</sub>)<sub>2</sub>O(CH<sub>2</sub>)<sub>2</sub>-, -(CH<sub>2</sub>)<sub>2</sub>N(CH<sub>2</sub>)<sub>2</sub>-, -(CH<sub>2</sub>)<sub>5</sub>-, or -(CH<sub>2</sub>)<sub>6</sub>-;

R<sup>3</sup> is a C<sub>1</sub>~C<sub>4</sub> alkyl, C<sub>1</sub>~C<sub>4</sub> alkyl substituted with alkyloxy or silyloxy, carboxylic group, C<sub>1</sub>~C<sub>4</sub> carbalkoxy group, hydroxyl methyl, C<sub>3</sub>~C<sub>6</sub> cycloalkyl, aryl or CH<sub>2</sub>OR<sup>4</sup>, R<sup>4</sup> being a C<sub>1</sub>~C<sub>4</sub> alkyl, tri-phenyl methyl, *t*-butyl- dimethylsilyl, benzyl unsubstituted or substituted with C<sub>1</sub>~C<sub>4</sub> alkyl, *para*-methoxy benzyl, *para*-nitrobenzyl, *para*-chlorobenzyl, 2, 4-dichlorobenzyl, 2, 4- dimethoxybenzyl, or trialkylsilyl groups;

Z is H, F, Cl, Br, I, CH<sub>3</sub>SO<sub>2</sub>, OH, PhCH<sub>2</sub>O, AcO, MeO, EtO, Me<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, Et<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>O, PhCH<sub>2</sub>OCO, *t*-Bu, *i*-Pr, NH<sub>2</sub>, or NO<sub>2</sub>;

P is hydrogen, a C<sub>1</sub>~C<sub>4</sub> alkyl, tri-phenylmethyl, *t*-butyldi- methylsilyl, benzyl unsubstituted or substituted with C<sub>1</sub>~C<sub>4</sub> alkyl; *para*-methoxy benzyl, *para*-nitrobenzyl, *para*-chlorobenzyl, 2,4-dichlorobenzyl, or 2, 4-dimethoxy- benzyl;

Y is H, Cl, Br, CH<sub>3</sub>SO<sub>2</sub>, CH<sub>3</sub>CH<sub>2</sub>SO<sub>2</sub>, NO<sub>2</sub>, or F;

R<sub>f</sub> is a C<sub>1</sub>~C<sub>4</sub> fluoro-containing alkyl;

R is a C<sub>1</sub>~C<sub>4</sub> alkyl, C<sub>3</sub>~C<sub>6</sub> cycloalkyl, or aryl group, aryl being a phenyl, naphenyl, furan, thiophene, or pyrrole;

halogen or halo is a fluoro, chloro, bromo, or iodo.

**Claim 8 (Previously presented):** The process of claim 1, wherein stoichiometric ratios are about 0.1- 3 : 0.1-3 : 1-4 :1 of ligand : Zinc salt: the organic base : substrate ketone or ketimine.

**Claim 9 (Previously presented):** The process of claim 1, wherein the salt is ZnCl<sub>2</sub>, ZnBr<sub>2</sub>, ZnF<sub>2</sub>, ZnI<sub>2</sub>, Zn(OTf)<sub>2</sub>, CuCl<sub>2</sub>, CuBr<sub>2</sub>, Cu(OTf)<sub>2</sub>, CuCl, CuBr, or Cu(OTf).

**Claim 10 (Previously presented):** The process of claim 1, wherein the organic base is MeN(*i*Pr)<sub>2</sub>, HNEt<sub>2</sub>, N(*i*Pr)<sub>3</sub>, pyridine, NEt<sub>3</sub>, piperidine, EtN(*i*Pr)<sub>2</sub>, or Bu<sub>3</sub>N.

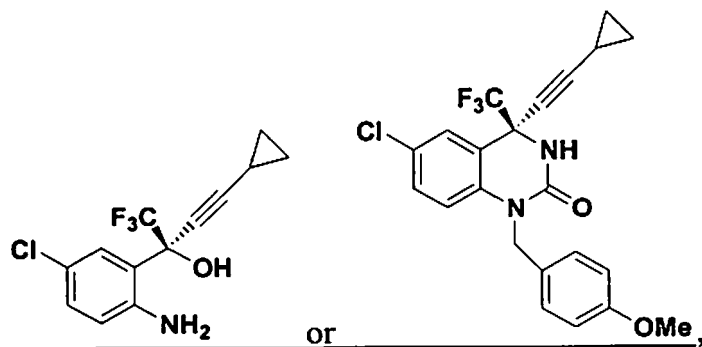
**Claim 11 (Previously presented):** The process of claim 1, wherein reaction temperature is 0-100°C.

**Claim 12 (Previously presented):** The process of claim 11, wherein the reaction temperature is 0-50°C.

**Claim 13 (Previously presented):** The process of claim 1, wherein the aprotic solvent is THF, dioxane, Et<sub>2</sub>O, benzene, a mono or multi-alkyl substituted-benzene, DME, toluene, n-hexane, CH<sub>2</sub>Cl<sub>2</sub>, cyclohexane, or a mixture thereof.

**Claim 14 (Previously presented):** The process of claim 1, further comprising the step of quenching the mixture by adding a proton source to give the chiral compound.

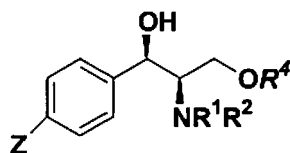
**Claim 15 (Currently amended):** The process of claim 1 for asymmetric synthesis of chiral compound of





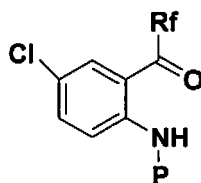
comprising the steps of

(a) mixing 0.1~3 molar equivalent of (1R,2R)-2-*N,N*-substitutedamino-1-(4-Z-substituted-phenyl)-3-O-*R*<sup>4</sup>-substituted propane-1-ol having a formula of

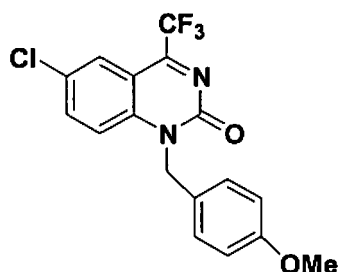


with 0.1~3 molar equivalent of cyclopropylacetylene, 0.1~3 molar equivalent of Zn(II), Cu(I) or Cu(II) salts, and 1~4 molar equivalent of an organic base in organic solvent to form a mixture;

(b) mixing ~~with~~ the mixture of step (a) with 1.0 molar equivalent of a reactant having a formula of



or

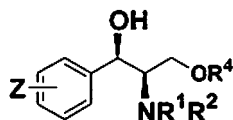


and maintaining resulting reaction mixture at a temperature of between about 0-50°C for 1-20 hrs;

(c) quenching by adding a proton source;

(d) obtaining the chiral compound.

**Claim 16 (Currently amended):** A compound or its enantiomer having a formula of



wherein  $R^1$ ,  $R^2$  is an amino protecting group;

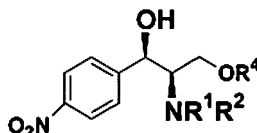
$R^4$  is an oxygen protecting group;

Z is  $\text{NO}_2$ ,  $\text{CH}_3\text{SO}_2$ , or  $\text{CH}_3\text{CH}_2\text{SO}_2$   $\text{CH}_3\text{CH}_2\text{SO}_3[;]$ , and

when Z is  $\text{NO}_2$  at 4-position of the phenyl,  $R^1$  is  $\text{N}=\text{O}$ ,  $R^2$  is  $\text{COCH}_3$ ,  $R^4$  is an alkyl, substituted alkyl, benzyl, substituted benzyl, or trialkylsilyl[;], or

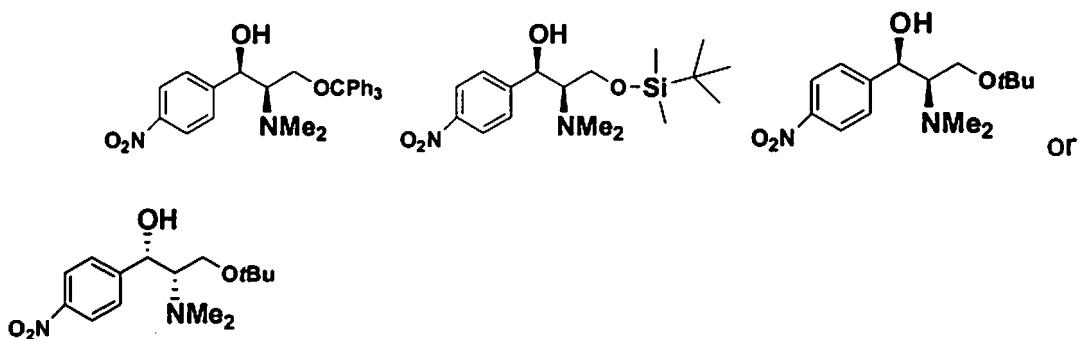
when Z is  $\text{NO}_2$  at 4-position of the phenyl,  $R^1$ ,  $R^2$  is  $\text{CH}_3$ , the ligand is (1R, 2R)-2-N,N-dimethylamino-1-(4-nitrophenyl)-3-O- $R^4$ -1-propanol.

**Claim 17 (Currently amended):** The compound of claim 16 having a formula of or its enantiomer



, wherein Z is  $\text{NO}_2$  at 4 position of the phenyl.

**Claim 18 (Previously presented):** The compound of claim 16, having a formula of or its enantiomer



**Claim 19 (Currently amended):** The compound of claim 16, wherein R<sup>1</sup> and R<sup>2</sup> is an alkyl, substituted alkyl, benzyl, trialkylsilyl, or substituted benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy, C<sub>1</sub>~C<sub>3</sub> hydroxyalkyl, C<sub>1</sub>~C<sub>4</sub> alkyl, or C<sub>1</sub>~C<sub>3</sub> alkoxy, or R<sup>1</sup>, R<sup>2</sup> being -(CH<sub>2</sub>)<sub>n</sub>X(CH<sub>2</sub>)<sub>m</sub>, X being a CH<sub>2</sub>, O, or NH;

n, m is an integer from 1 to 6;

R<sup>4</sup> is an alkyl, substituted alkyl, benzyl, or substituted benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy, C<sub>1</sub>~C<sub>3</sub> hydroxy alkyl, alkyl, C<sub>1</sub>~C<sub>3</sub> alkoxy, or CN;

Z is NO<sub>2</sub>, CH<sub>3</sub>SO<sub>2</sub>, or CH<sub>3</sub>CH<sub>2</sub>SO<sub>2</sub> [;], and

when Z is NO<sub>2</sub> at 4-postion of the phenyl, R<sup>1</sup> is N=O, R<sup>2</sup> is COCH<sub>3</sub>, R<sup>4</sup> is only alkyl, substituted alkyl, benzyl, substituted benzyl, or trialkylsilyl[;], or

when Z is NO<sub>2</sub> at 4-postion of the phenyl, R<sup>1</sup>, R<sup>2</sup> is CH<sub>3</sub>, the ligand is (1R, 2R)-2-N,N-dimethyl-1-(4-nitrophenyl)-3-O-R<sup>4</sup>-1-propanol.

**Claim 20 (Currently amended):** The compound of claim 16, wherein R<sup>1</sup> and

$R^2$  is a  $C_1\sim C_{20}$  alkyl,  $C_1\sim C_{20}$  substituted alkyl, trialkylsilyl, benzyl, or substituted benzyl, the substituted group of alkyl or benzyl being a phenyl, naphenyl, halo, nitro, hydroxy,  $C_1\sim C_3$  hydroxyalkyl,  $C_1\sim C_4$  alkyl,  $C_1\sim C_3$  alkoxy, or CN, or  $R^1$ ,  $R^2$  being -  
 $(CH_2)_nX(CH_2)_m$ -, X being  $CH_2$ , O or NH;

n, m is an integer from 1 to 6;

$R^4$  is a  $C_1\sim C_{20}$  alkyl,  $C_1\sim C_{20}$  substituted alkyl, benzyl, trialkylsilyl, or substituted benzyl, the substituted group being a phenyl, naphenyl, halo, nitro, hydroxy,  $C_1\sim C_3$  hydroxyalkyl,  $C_1\sim C_4$  alkyl,  $C_1\sim C_3$  alkoxy, or CN;

Z is  $CH_3SO_2$  or  $NO_2$ [:], and

when Z is  $NO_2$  at 4-postion of the phenyl,  $R^1$  is  $N=O$ ,  $R^2$  is  $COCH_3$ ,  $R^4$  is an alkyl, substituted alkyl, benzyl, substituted benzyl, or trialkylsilyloxy[:], or

when Z is  $NO_2$  at 4-postion of the phenyl,  $R^1$ ,  $R^2$  is  $CH_3$ , the ligand is (1R, 2R)-2-N,N-dimethyl- amino-1-(4- nitrophenyl )-3-O- $R^4$ -propane-1-ol.

**Claim 21 (Currently amended):** The compound of claim 16, wherein  $R^1$  and  $R^2$  is a  $C_1\sim C_4$  alkyl, tri-phenyl methyl, *t*-butyldimethylsilyl, benzyl unsubstituted or substituted with  $C_1\sim C_4$  alkyl, *para*-methoxy benzyl, *para*-nitrobenzyl, *para*-chlorobenzyl, 2, 4-dichlorobenzyl, 2, 4-dimethoxybenzyl;

$R^4$  is a  $C_1\sim C_4$  alkyl, tri-phenyl methyl, *t*-butyldimethylsilyl, benzyl unsubstituted or substituted with  $C_1\sim C_4$  alkyl, *para*-methoxy benzyl, *para*-nitrobenzyl, *para*-chlorobenzyl, 2, 4-dichlorobenzyl, or 2, 4-dimethoxybenzyl;

Z is  $CH_3SO_2$  or  $NO_2$ [:], and

when Z is NO<sub>2</sub> at 4-position of the phenyl, R<sup>1</sup> is N=O, R<sup>2</sup> is COCH<sub>3</sub>, R<sup>4</sup> is an alkyl, substituted alkyl, benzyl, substituted benzyl, or trialkylsilyl[;], or

when Z is NO<sub>2</sub> at 4-position of the phenyl, R<sup>1</sup>, R<sup>2</sup> is CH<sub>3</sub>, the ligand is (1R, 2R)-2-N,N-dimethyl-amino-1-(4-nitrophenyl)-3-O-R<sup>4</sup>-propane-1-ol.